Bewegungsgleichungen der fluiden Phase

- im zeitlichen Mittel stationäre, inkompressible und isotherme Strömung
- Newton'sches Fluid, konstante Materialeigenschaften
- 3–dimensionale, zeitlich gemittelte Form der Transportgleichungen :

$$\frac{\partial}{\partial x}(\rho_F\, u_F\, \Phi) + \frac{\partial}{\partial y}(\rho_F\, v_F \Phi) + \frac{\partial}{\partial z}(\rho_F\, w_F \Phi) =$$

$$\frac{\partial}{\partial x}\left(\Gamma_\Phi \frac{\partial \Phi}{\partial x}\right) + \frac{\partial}{\partial y}\left(\Gamma_\Phi \frac{\partial \Phi}{\partial y}\right) + \frac{\partial}{\partial z}\left(\Gamma_\Phi \frac{\partial \Phi}{\partial z}\right) + S_\Phi + S_\Phi^P$$

- Quellterme / Transportkoeffizienten für die verschiedenen Variablen Φ :

Φ	S_Φ	S_Φ^P	Γ
1	0	0	0
u_F	$\frac{\partial}{\partial x}\left(\Gamma_\Phi \frac{\partial u_F}{\partial x}\right) + \frac{\partial}{\partial y}\left(\Gamma_\Phi \frac{\partial v_F}{\partial x}\right) + \frac{\partial}{\partial z}\left(\Gamma_\Phi \frac{\partial w_F}{\partial x}\right) - \frac{\partial p}{\partial x} + \rho_F f_x$	$S_{u_F}^P$	μ_{eff}
v_F	$\frac{\partial}{\partial x}\left(\Gamma_\Phi \frac{\partial u_F}{\partial y}\right) + \frac{\partial}{\partial y}\left(\Gamma_\Phi \frac{\partial v_F}{\partial y}\right) + \frac{\partial}{\partial z}\left(\Gamma_\Phi \frac{\partial w_F}{\partial y}\right) - \frac{\partial p}{\partial y} + \rho_F f_y$	$S_{v_F}^P$	μ_{eff}
w_F	$\frac{\partial}{\partial x}\left(\Gamma_\Phi \frac{\partial u_F}{\partial z}\right) + \frac{\partial}{\partial y}\left(\Gamma_\Phi \frac{\partial v_F}{\partial z}\right) + \frac{\partial}{\partial z}\left(\Gamma_\Phi \frac{\partial w_F}{\partial z}\right) - \frac{\partial p}{\partial z} + \rho_F f_z$	$S_{w_F}^P$	μ_{eff}
k	$P_k - \rho_F\, \varepsilon$	0	$\frac{\mu_t}{\sigma_k}$
ε	$\frac{\varepsilon}{k}(c_{\varepsilon_1} P_k - c_{\varepsilon_2}\, \rho_F\, \varepsilon)$	0	$\frac{\mu_t}{\sigma_\varepsilon}$

$$P_k = \mu_t \left\{ 2 \cdot \left[\left(\frac{\partial u_F}{\partial x}\right)^2 + \left(\frac{\partial v_F}{\partial y}\right)^2 + \left(\frac{\partial w_F}{\partial z}\right)^2 \right] + \left(\frac{\partial u_F}{\partial y} + \frac{\partial v_F}{\partial x}\right)^2 + \left(\frac{\partial u_F}{\partial z} + \frac{\partial w_F}{\partial x}\right)^2 + \left(\frac{\partial w_F}{\partial y} + \frac{\partial v_F}{\partial z}\right)^2 \right\}$$

$$\mu_{eff} = \mu + \mu_t \quad , \quad \mu_t = \rho_F c_\mu \frac{k^2}{\varepsilon}$$

$$c_\mu = 0.09 \quad , \quad c_{\varepsilon_1} = 1.44 \quad , \quad c_{\varepsilon_2} = 1.92 \quad , \quad \sigma_k = 1.0 \quad , \quad \sigma_\varepsilon = 1.3$$